2011 Black Bear Capture-recapture Population Estimate

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Introduction:

A capture-recapture technique to estimate free-ranging black bear (*Ursus americanus*) populations through the use of a tetracycline biomarker was developed in Minnesota and Michigan (Garshelis & Visser, 1997). This technique allows for the marking of large numbers of individuals at a landscape scale through passive bait-based tetracycline exposure. Tetracycline incorporates into bone tissue with recapture through analysis of hunter-harvested rib samples.

A bio-marker based capture-recapture population estimate was completed in 2006 (MacFarland, 2009). This estimate was significantly higher than those previously calculated using the state's accounting style population model (Rolley & Woodford, 2006). In response, the bear advisory committee recommended increased harvest quotas beginning in 2009. A second capture-recapture population estimate was recommended by the advisory committee to compare with the first study's results and to evaluate the impact of higher harvest.

Methods:

In spring of 2011 DNR personnel and volunteers placed baits in sections 8, 11 ,26 and 29 of each township throughout 32 counties in Northern and Central Wisconsin resulting in a grid with a bait placed approximately every 3 miles. Counties with 5 or more bears harvested in each of the last 3 years were selected for baiting. Baits consisted of nine 500mg tetracycline hydrochloride capsules inserted into 9 marshmallows encased in approximately 1kg of peanut butter. Baits were placed in wooden boxes and affixed to smooth barked trees. Bait stations were inspected after approximately 14 days exposure. If the bait was consumed, visual inspection of the tree and measurements of claw width were used to determine if a bear consumed the bait.

Successful hunters in fall 2011 were asked to submit a rib and tooth sample. Ribs were analyzed for tetracycline exposure. If no rib was available the tooth was analyzed. For all tetracycline positive samples the corresponding tooth was analyzed to determine year of exposure. Data was corrected for the background rate of tetracycline exposure. Analysis of rib, cartilaginous rib and tooth marking rates suggests there is no difference between tissue types therefore data was combined for final analysis.

Data was analyzed using a Chapman bias corrected Lincoln-Petersen 2 occasion population estimator (Amstrup, McDonald, & Manly, 2005).

Results:

A total of 3,322 baits were placed across 32 counties, 957 were consumed by bears (figure 1). 3,948 tissue samples were analyzed for the presence of tetracycline exposure, 204 were exposed to tetracycline in 2011. Analysis of data returns a statewide bear population estimate of 18,453 ± 2,176. Zone specific estimates are provided in Table 1. Estimates refer to a pre-hunt 2011 bear population not including cubs.

Discussion:

Results of the 2006 population study indicated a state-wide population of 33,657 ± 5,832 (Table 2). Deficiencies in bait coverage likely biased this estimate upward due to violation of the assumption of equal probability of capture. Despite this potential bias, these data suggest the bear population has declined since 2006. Harvest averaged 3,592 animals in the five harvests between studies (Table 3). Decline in the estimated population suggests recent quotas have put downward pressure on the bear population in accordance with the state's management objectives. 2011 and 2012 bear harvest both exceeded 4,250 bears likely leading to further population decline during this period.

The analyses presented in this report are preliminary. Hunters submitted rib and tooth samples again in 2012. Analysis of these samples and incorporation of data into the population estimate is pending. A final report will be available in fall 2013.

Literature Cited:

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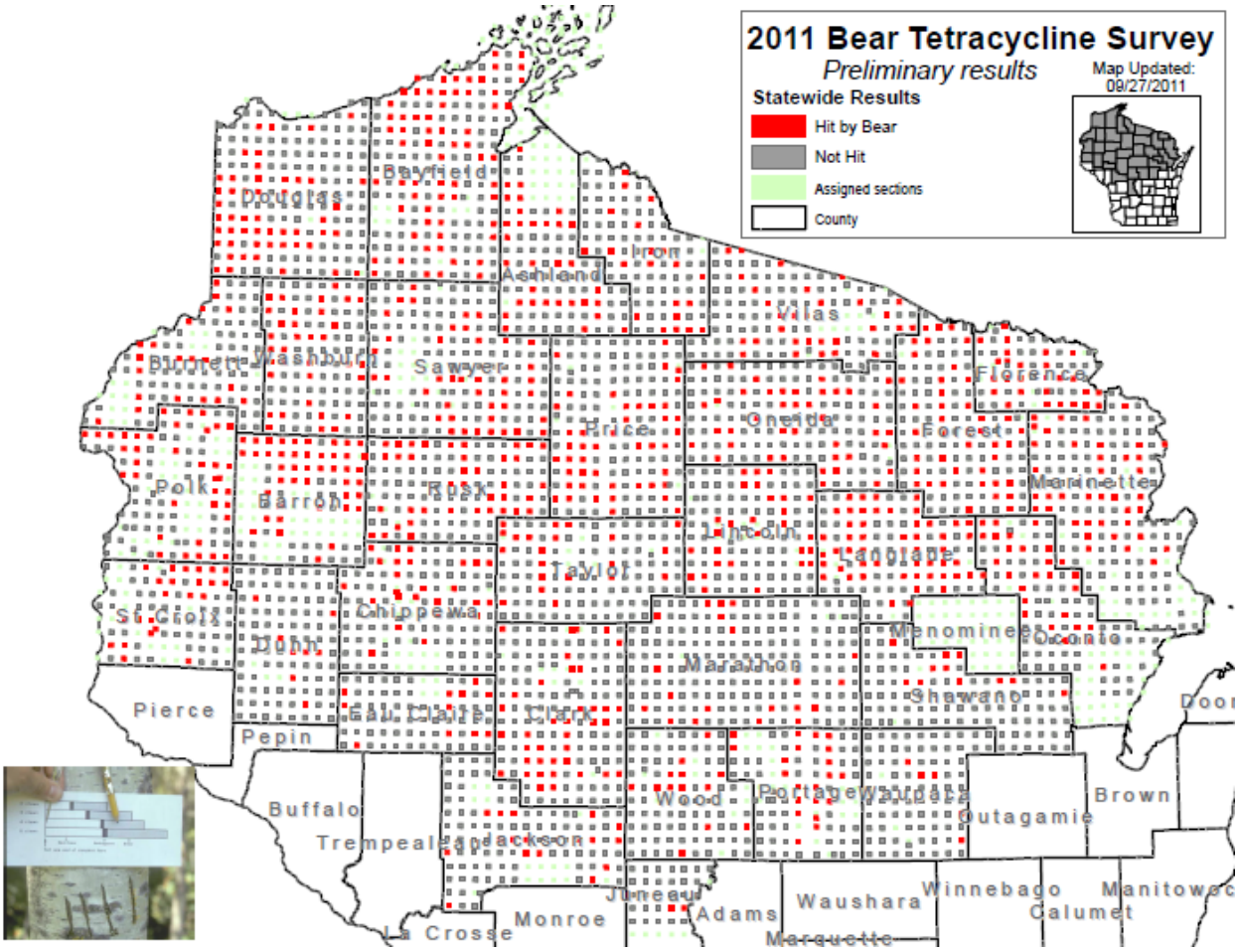

Figure 1: Location and result of tetracycline baits.

Table 1: 2011 pre-hunt adult black bear population estimates. Confidence intervals (CI) are 95%.

Zone	Population estimate	CI	CI as % of estimate	Upper limit of CI	Lower limit of CI
A	5,324	1,127	21.17%	6,451	4,197
B	3,178	618	19.43%	3,795	2,560
C	4,798	1,441	30.04%	6,239	3,357
D	4,826	1,185	24.57%	6,011	3,640
ABD	13,495	1,707	12.65%	15,203	11,788
State-wide	18,453	2,176	11.79%	20,629	16,278

Table 2: 2006 pre-hunt adult black bear population estimates. Confidence intervals (CI) are 95%.

Zone	Population estimate	CI	CI as % of estimate	Upper limit of CI	Lower limit of CI
A	8,381	2,435	29.05%	10,816	5,947
B	5,163	1,828	35.41%	6,991	3,335
C	9,570	4,102	42.86%	13,672	5,467
D	9,119	2,716	29.78%	11,835	6,402
ABD	23,415	4,306	18.39%	27,721	19,110
State-wide	33,657	5,832	17.33%	39,489	27,825

Table 3: Black bear harvest between the 2006 and 2011 tetracycline population estimates

Year	Harvest
2006	3,068
2007	2,797
2008	2,955
2009	4,099
2010	5,133